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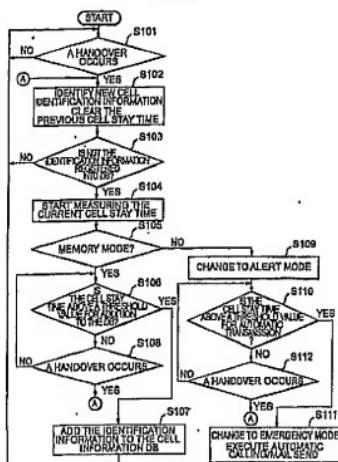
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(54) Abstract Title  
Mobile communication device capable of notifying user when deviating from a predetermined area

(57) The invention deals with tracking the location of a mobile phone so that an alerting message which may contain current location of the mobile, can be sent when the phone (i.e. the user) enters a previously unregistered area. In the operational mode the user may register the newly encountered region as being permissible to enter. In the alert mode a warning message will be sent to the mobile phone and/or another phone to notify that the user is outside the registered region. A predetermined waiting period is maintained before an alert signal is sent. Additional features disclosed include setting a threshold speed limit to indicate abnormal movement and sending alert signal when the measured speed exceeds the threshold. The invention is aimed at tracing users when they are lost or abducted and enter an unfamiliar/unregistered region. A notification may also indicate loss or theft of mobile phone. When such a notification is sent to another mobile phone, the user may be contacted to check if the person is lost or abducted.

FIG.3



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FIG.1

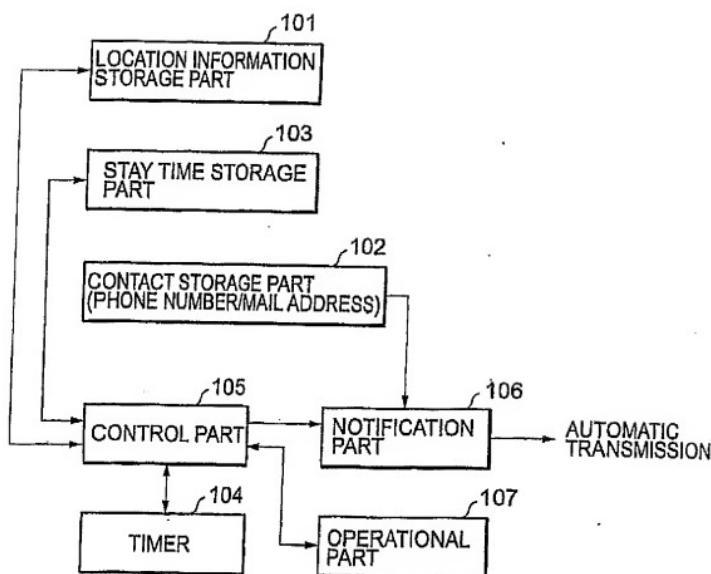


FIG.2

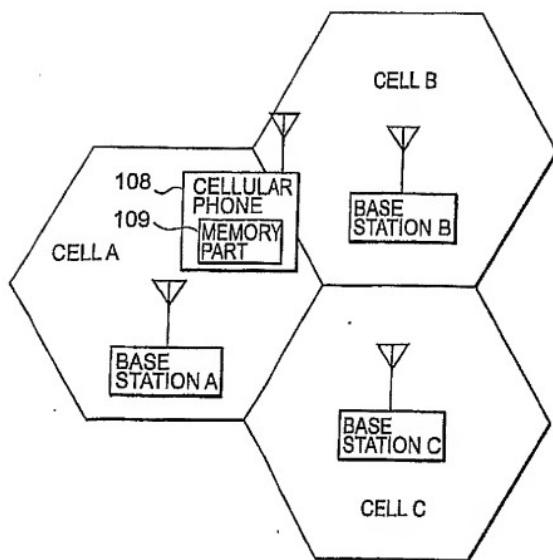


FIG.3

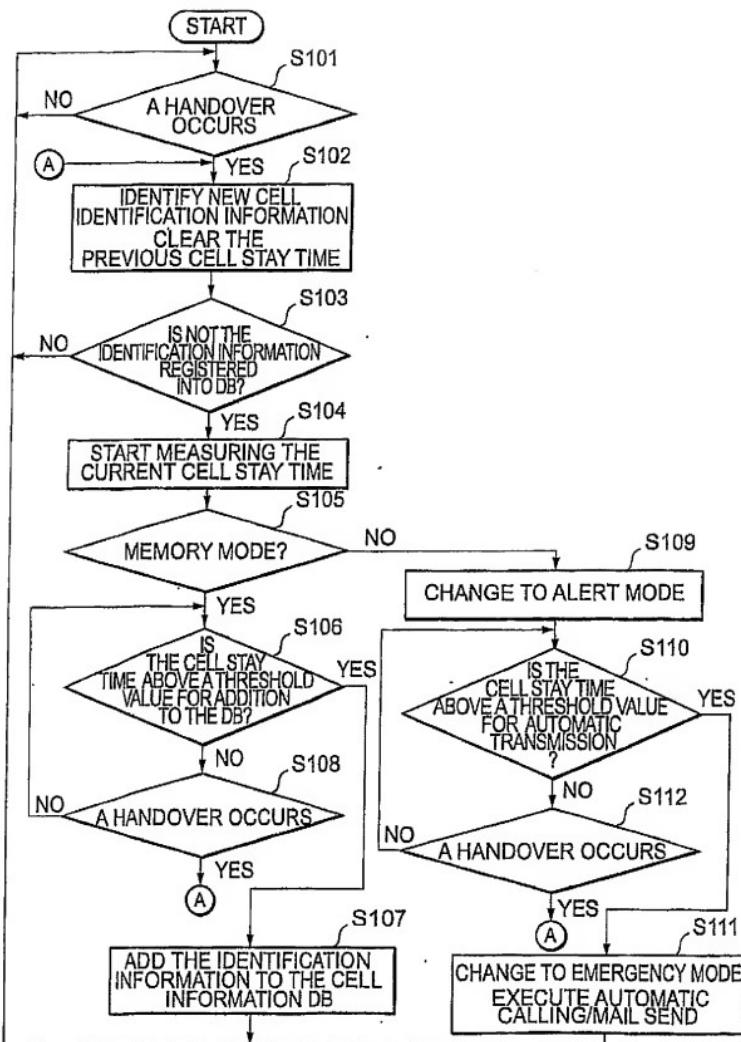


FIG. 4

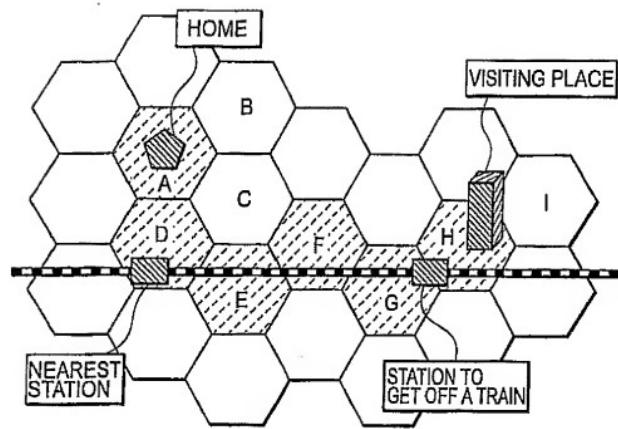


FIG. 5

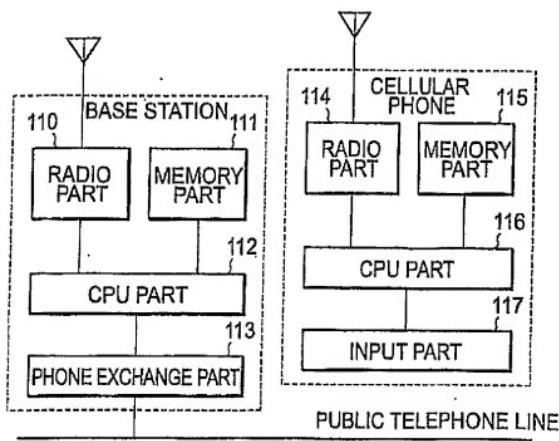
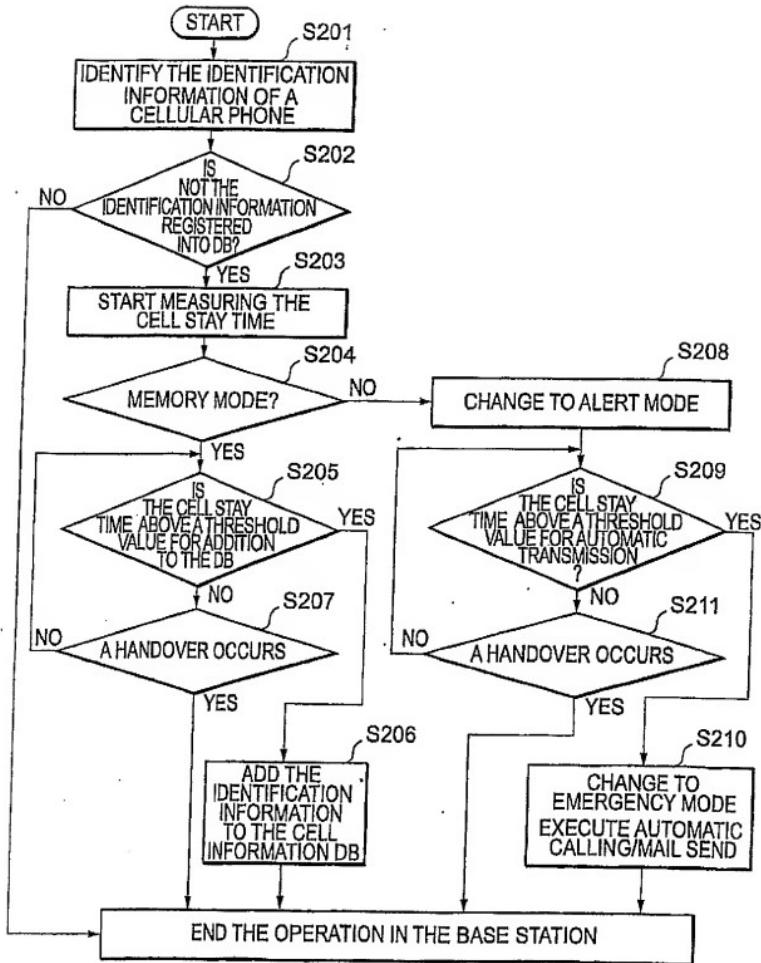


FIG. 6



MOBILE COMMUNICATION DEVICE CAPABLE OF NOTIFYING  
USER WHEN DEVIATING FROM A PREDETERMINED AREA

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a mobile communication device, e.g., a cellular phone, and to a mobile communication system using the mobile communication device. More specifically, the present invention relates to a mobile communication device having an automatic transmission function when the mobile communication device deviates from a predetermined activity range. Moreover, the present invention relates to a mobile communication system having an automatic transmission function when a mobile communication device deviates from a predetermined activity range.

2. Description of the Related Art

A location information system using a cellular phone is described in Japanese Laid-Open Patent Application Heisei 8-9450. In the location information system, a terminal device moving between base stations receives a signal transmitted from the base stations and outputs a location information signal indicating the reception thereof, thereby registering the location information signal into a common database. When a search requester searches for the terminal device, the location information of the terminal device is read from the common database and is sent to the search requester.

In the location information system, the search requester must initiate the search request when he/she desires to know the location information of the

terminal device. In addition, since the location information of the terminal device is read after the search request is received from the search requester, it takes time to obtain the location information of the terminal device. When a terminal device is lost or stolen or the owner of the terminal device is missing or kidnapped, a delay in obtaining the location information is an important problem.

#### SUMMARY OF THE INVENTION

An aspect of the preferred embodiments of the present invention is to provide a mobile communication device that automatically transmits a message when there is deviation from a registered activity range. In addition, an aspect of the preferred embodiments of the present invention is to provide a mobile communication system that automatically transmits a message when there is deviation from a registered activity range of a mobile communication device.

A mobile communication device comprises registering means for registering area information about area that includes a base station, and storing means for storing information about an apparatus. The mobile communication device further comprises judging means for judging whether or not the mobile communication device is in a registered area in the registering means. The mobile communication device further comprises notifying means for notifying deviation from the registered area to the apparatus when it is judged that the mobile communication device is not in the registered area. The notifying means sends current location information of the

mobile communication device to the apparatus at the same time. The mobile communication device further comprises a counting means for counting time while the mobile communication device stays in an unregistered area. The notifying means may notify the apparatus about a deviation from the registered area when the counted time reaches a predetermined time. The registering means registers area information about new area if the area information is not registered into the registering means when the counted time reaches a predetermined time. The mobile communication device further comprises a sending means for sending back the current location information upon inquiry from a specified party. Preferably, the mobile communication device is a portable telephone. Moreover, the mobile communication device of the present invention further comprises a counting means for counting time when the mobile communication device cannot contact with a base station. The notifying means notifies the apparatus of a deviation from the registered area when the counted time reaches a predetermined time. The mobile communication device further comprises a calculating means for calculating a time interval during which a handover occurs between base stations. The notifying means notifies the apparatus for a deviation from the registered area when the time is over a predetermined time. The notifying means does not notify the apparatus for a deviation from the registered area when the time is below a predetermined time. The mobile communication device further comprises a calculating means for calculating a moving speed based on the size of the area and the location information from the base station. The notifying means notifies the apparatus for a deviation from the registered area when the

time is over a predetermined time. The notifying means does not notify the apparatus for a deviation from the registered area when the time is below a predetermined time.

Another aspect of the present invention provides a mobile communication device comprises a registering circuit that registers area information about area that includes a base station, and a storing circuit that stores information about an apparatus. The present invention further provides a judging circuit that judges whether or not the mobile communication device is in a registered area in the registering circuit. The present invention further provides a notifying circuit that notifies deviation from the registered area to the apparatus when it is judged that the mobile communication device is not in the registered area. The notifying circuit sends a current location information of the mobile communication device to the apparatus at the same time. The mobile communication device further comprises a counter that counts time while the mobile communication device stays in an unregistered area. The notifying circuit notifies the apparatus about a deviation from the registered area when the counted time reaches a predetermined time. The registering circuit registers area information about new area when the counted time reaches a predetermined time. The mobile communication device further comprises a sending circuit that sends back the current location information upon inquiry from a specified party. The mobile communication device is preferably a portable telephone. The mobile communication device further comprises a counter that counts time while the mobile communication device cannot contact with a base station. The notifying

circuit notifies the apparatus about a deviation from the registered area when the counted time reaches a predetermined time. The mobile communication device further comprises a calculator that calculates a time interval during which a handover occurs between base stations. The notifying circuit notifies the apparatus about a deviation from the registered area when the time is over a predetermined time. The notifying circuit does not notify the apparatus about a deviation from the registered area when the time is below a predetermined time. The mobile communication device further comprises a calculator that calculates a moving speed based on the size of the area and the location information from the base station. The notifying circuit notifies the apparatus about a deviation from the registered area when the time is over a predetermined time. The notifying circuit does not notify the apparatus about a deviation from the registered area when the time is below a predetermined time.

The present invention further provides a base station comprising a registering means for registering identification information of a mobile communication device, and a storing means for storing information about an apparatus. The base station further comprises a judging means for judging whether or not the identification information of the mobile communication device is registered into the registering means. The base station further comprises a notifying means for notifying deviation from an activity range to the apparatus when the identification information of the mobile communication device is not registered into the registering means. The notifying means sends current location information of the mobile communication device to the apparatus at the same

time. The base station further comprises a counting means for counting time while the mobile communication device stays in an area covered by the base station when the identification information of the mobile communication device is not registered into the registering means. The notifying means notifies the apparatus of a deviation from the activity range when the time reaches a predetermined time. The registering means registers the identification information of the mobile communication device if the identification information is not registered into the registering means when the time reaches a predetermined time. The base station further comprises sending means for sending the current location information of the mobile communication device upon inquiry from a specified party. The mobile communication device is preferably a portable telephone.

Alternatively, the present invention provides a base station comprising a registering circuit that registers identification information of a mobile communication device, and a storing circuit that stores information about an apparatus. The base station further comprises a judging circuit that judges whether or not the identification information of the mobile communication device is registered into the registering circuit, and a notifying circuit that notifies deviation from an activity range to the apparatus when the identification information of the mobile communication device is not registered into the registering circuit. The notifying circuit sends a current location information of the mobile communication device to the apparatus at the same time. The base station further comprises a counter that counts time while the mobile

communication device stays in an area covered by the base station when the identification information of the mobile communication device is not registered into the registering circuit. The notifying circuit notifies the apparatus of a deviation from the activity range when the counted time reaches a predetermined time. The registering circuit registers the identification information of the mobile communication device if the identification information is not registered into the registering circuit when the counted time reaches a predetermined time. The base station further comprises a sending circuit that sends the current location information of the mobile communication device upon inquiry from a specified party. The mobile communication device is preferably a portable telephone.

The present invention also provides a method for notifying an apparatus about a deviation from a predetermined area. The method comprises registering area information about the predetermined area that includes a base station, and storing information about an apparatus. The method further comprises judging whether or not a mobile communication device is in the predetermined area, and notifying the apparatus of a deviation from the predetermined area when it is judged that the mobile communication device is not in the predetermined area. The method for notifying deviation from a predetermined area further comprises sending a current location information of the mobile communication device to the apparatus. The method for notifying the apparatus of a deviation from a predetermined area further comprises counting time while the mobile communication device stays in a predetermined area and notifying the apparatus of a deviation from the predetermined area when the

counted time reaches a predetermined time. The method for notifying deviation from a predetermined area further comprises judging whether or not the area information of the base station that the mobile communication terminal contacts with has already registered, and registering area information about new area if the area information is not registered when the time reaches a predetermined time. The method for notifying deviation from a predetermined area further comprises sending back the current location information upon inquiry from a specified party. The mobile communication device is preferably a portable telephone.

According to the present invention, when moving to the unregistered area, deviation from the activity range is notified automatically. The person who receives the notification can find that the cellular phone user is located in a cell different from the normal life space and can check whether he/she is safe or not by a return mail or phone. When an emergency state such as loss/stealing or kidnapping/missing is caused, a quick response can be made.

#### BRIEF DESCRIPTION OF THE DRAWINGS.

Preferred features of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

FIG. 1 is a block diagram showing an embodiment of a mobile communication device according to the present invention;

FIG. 2 is a diagram showing an example of a base station and cell distribution;

FIG. 3 is a flowchart for explaining the operation of the embodiment shown in FIG. 1;

FIG. 4 is a diagram showing, together with a cell distribution, a route when a cellular phone user moves from home to a visiting place;

FIG. 5 is a diagram showing an embodiment of a mobile communication system according to the present invention; and,

FIG. 6 is a flowchart for explaining the operation of the system shown in FIG. 5.

#### DETAILED DESCRIPTION OF THE INVENTION

Henceinafter, each embodiment of the present invention will be described in detail with reference to the drawings.

FIG. 1 is a block diagram showing an embodiment of a mobile communication device of the present invention. In this embodiment, the mobile communication device will be described by using a cellular phone as an example. In the drawing, the numeral 101 denotes a location information storage part storing the identification information (location information) from a base station as a normal activity range (a cell of the base station). The numeral 102 denotes a contact storage part storing a registered contact such as a phone number/mail address. The numeral 103 denotes a stay time storage part storing a cell stay time of a cellular phone/cellular phone user. The numeral 104 denotes a timer. The numeral 105 denotes a control part that controls the device. The numeral 106 denotes a notification part that notifies when there is deviation from the activity

range to the phone number stored into the contact storage part 103. The numeral 107 denotes an operational part. In FIG. 1, circuits and mechanisms such as a radio transmitter and receiver for radio signals, an antenna, a microphone, a speaker and a liquid crystal display are omitted.

FIG. 2 is a diagram showing an example of a base station and cell distribution. In FIG. 2, cells A, B and C are areas handled by base stations A, B and C, respectively. A cellular phone 108 typically performs location registration as an optimum radio phone contacted party into any one of the base stations A, B or C based on the result obtained by measuring an electric field intensity determined in proportion to distance. In general, the base stations have identification information (location information) inherent therein and a cellular phone can specify an approximate location (cell) upon reception of the identification information. The numeral 109 denotes a memory part and the location information storage part 101, the contact storage part 102, and the stay time storage part 103 in the cellular phone explained in FIG. 1 are generically called the memory part.

In this embodiment, a cellular phone user in a normal life space (activity range) sets a cellular phone 4 to a memory mode. The user stores as the normal life space the location information of a cell of a base station into the location information storage part 101 in the cellular phone 4. In other words, the activity range of the cellular phone user is stored. To prevent a cell (as a simple passage space) from being identified as the life space, the cellular phone 4 must stay in the same cell beyond the set time (in the case that the same base station

is a contacted party). When the set time is exceeded, the identification information received from the base station is registered.

Upon completion of collection of the location information of the base stations in the memory mode, the cellular phone 108 is changed to a notification mode. In the notification mode, the cellular phone 108 judges to be in a cell out of the activity range to detect deviation from the normal activity range when an unregistered base station which is not registered into the location information storage part 101 of the memory part 109 is a contacted party.

At this time, the cellular phone 108 is changed to an alert mode. When the contacted party is the unregistered base station beyond the set time, the cellular phone 108 is changed to an emergency mode. After the change to the emergency mode, the cellular phone 108 automatically transmits, to a contact (mail address/phone number) registered into the contact storage part 102, a mail or voice phone including the registered contents (a message indicating abnormality of the activity range deviated from the normal activity range) and the identification information (location information) received from the base station at that time.

The specific operation of this embodiment will be described with reference to the flowchart shown in FIG. 3. At first, the operation for setting the cellular phone 108 to the memory mode and storing the location information of the normal activity range into the location information storage part 101 is described. Operating the operational part 107 sets the operation mode. By way

of example, the case of a normal activity range in which the cellular phone user moves from home to a visiting place, as shown in FIG. 4, will be described.

In FIG. 3, the cellular phone user staying at home turns on the cellular phone, and then, operates it by the operational part 107 to be set to the memory mode. At this time, a handover (switching of the base stations as a contacted party of the cellular phone) occurs (S101). Then, the control part 105 in the cellular phone identifies the identification information (location information) from new cell A to clear the stay time of the previous cell stored into the stay time storage part 103 (S102). In this case, since the memory mode has just started, the stay time of the previous cell is not stored into the stay time storage part 103 and the stay time of the previous cell need not be cleared.

It is determined whether or not the identification information from base station A is registered into the location information storage part 101 (S103). Since nothing is registered into the location information storage part 101 at this time, the routine is advanced to S104 so that the timer 104 is activated to start measuring the stay time of the current cell A (S104). It is next determined whether or not the operation mode of the cellular phone is the memory mode (S105). Since it is set to the memory mode at this time, the routine is advanced to S106. In S106, the measured value of the timer 104 is monitored to register the identification information from the base station A into the location information storage part 101 when the stay time of the current cell A is beyond the set time (S107). The process from S101 is performed again.

When a handover occurs in S108 before the measured value of the timer 104 reaches the set time in S106, the process from S102 is performed without registering the identification information from the base station A. When the stay time in the cell is shorter than the set time, the identification information from the base station is not registered so as not to identify it as the normal activity range, as described above.

When the cellular phone user leaves home to move to the nearest station and the cell A including his/her home is switched to cell D including the nearest station, a handover occurs (S101). At this time, the control part 105 in the cellular phone identifies the identification information from new cell D to clear the stay time of the previous cell A stored into the stay time storage part 103 (S102).

The timer 104 is activated to start measuring the stay time of the current cell D (S104) to judge whether the operation mode is the memory mode or not (S105). At this time, since it is the memory mode, the routine is advanced to S106. When the measured value of the timer 104 is beyond the set time, the identification information from base station D is registered into the location information storage part 101 (S107). In this case, the stay time in the cell D is beyond the set time and the identification information from the base station D is registered into the location information storage part 101.

The cellular phone user gets on a train at the nearest station of the cell D and passes through cells E and F to go to the station of cell G to get off the train. In this case, each time a handover occurs in the cells E, F and G (S101), the

process of S101 to S108 of FIG. 3 is repeated. The stay time of the cells E and F is only a time during which the train passes. The identification information of the base stations of the cells E and F is registered and the identification information from the base station of the cell G including a station to get off the train is also registered.

When arriving at the nearest station, the cellular phone user goes to cell H including a visiting place. When a handover occurs in the cell H, the process of FIG. 3 is executed. In this case, the stay time in the cell H is longer than the set time and the identification information from the base station in the cell H is registered. In the memory mode, the identification information from the base stations is sequentially registered as the normal activity range of the cellular phone user into the location information storage part 101. The identification information from the base stations in the cells A, D, E, F, G and H is registered into the location information storage part 101.

The operation of the notification mode will be described. The cellular phone user switches the operation mode from the memory mode to the notification mode. In the notification mode, when the cellular phone user is in the normal activity range, that is, in the activity range's (the cells A, D, E, F, G and H) registered into the location information storage part 101, the routine is advanced to S103 after the process of S101 and S102 of FIG. 3, a determination is made whether or not the identification information from the base station is registered. The routine is thus advanced to S101. In other words, in the normal registered cell, the process of S101 to S103 is repeated.

When the activity range of the cellular phone/cellular phone user is deviates from the registered cell, e.g., when he/she leaves home to go to the cell B in the opposite direction without going to the cell D including the nearest station, or when he/she leaves the cell H including a visiting place to go to the cell I in the opposite direction without going to the cell G including the nearest station, the identification information is determined to be unregistered in S103 after the process of S101 and S102. The routine is thus advanced to S104. The timer 104 is activated to start measuring the stay time of the current cell (for example, the cell B).

A determination is made whether the operation mode is the memory mode in S105. At this time, the operation mode set to the notification mode is changed to the alert mode (S109). When it is changed to the alert mode, the measured value of the timer 104 is monitored (S110). When the measured value of the timer 104 is beyond the set time, it is moved to the emergency mode.

In the emergency mode, the notification part 106 automatically notifies, by means of voice or mail, a message registered into the phone number or mail address registered into the contact storage part 102, e.g., a message notifying deviation from the normal activity range and the location information received from the base station of the current area (S111).

When a handover occurs in S112 before the measured value of the timer 104 reaches the set time in S110, the process from S102 is performed without change to the emergency mode. Depending on an electric wave state,

particularly, in the case of stay in the corner of the cell, a handover may occur. Deviation from the activity range is not notified to avoid error notification.

When the cellular phone is moved to an untargeted area which makes communication impossible in the flowchart of FIG. 3, the base station as a contacted party of the cellular phone cannot be secured. In such a case, when the base station as a contacted party cannot be secured in a series of the process flow from S101 in the notification mode, the time is measured. When the notification mode is changed to the alert mode and the measured time elapses beyond the set time in S110, the alert mode is readily changed to the emergency mode in S111 for automatic transmission. This allows deviation from the activity range to be notified when the cellular phone is moved to the untargeted area.

In this embodiment, upon deviation from the registered cell, deviation from the activity range is notified automatically. The person who receives the notification can find that the cellular phone user is located in a cell different from the normal life space and can check whether he/she is safe or not by a return mail or phone. The location information from the base station in the current cell is notified at the same time. Therefore, it is possible to acquire the approximate location information on where the cellular phone user is located currently.

This embodiment automatically notifies that the cellular phone/cellular phone user is located in a cell different from the normal one. When an emergency state such as loss/stealing or kidnapping/missing is caused,

a quick response can be made. The cellular phone of this embodiment is put in a bag or a car so that a quick response can be made when they are stolen.

The above embodiment uses the cell (the base station as a contacted party) as the unit of the activity range. In the case of a cell which can obtain a plurality of pieces of identification information in one cell (multi-zoned cell), the zone can be the unit in place of the cell.

In FIG. 3, in the case of stay in the unregistered cell beyond the set time, deviation from the activity range is transmitted automatically. The present invention is not limited to this. Specifically, there is calculated a time interval of handover occurrence or a moving speed of the cellular phone based on the size of the cell and the identification information obtained from the base station. Then, when the time interval is shorter than the set value and the moving speed exceeds the set value in S110, stay in the unregistered cell beyond the set time will not perform automatic transmission.

When moving at high speed by taxi or train, the cell may be the unregistered cell in the memory mode. In the case of stay in the unregistered cell beyond the set time, automatic transmission may not be performed. When there is no possibility of movement at high speed in the manner of a child walking to school, movement at high speed is abnormal. Whether the time interval is below the set value or not, or whether the moving speed is above the set value or not is judged in S110. When the time interval is below the set value or the moving speed is above the set value, automatic transmission is desirable.

In the case of stay in the unregistered cell beyond the set time, the cellular phone actively performs automatic transmission. It is also possible to passively transmit the current location information to the set destination by a trigger from outside. The cellular phone identifies the identification information from the base station of the cell at the current location constantly. The identification information is notified to indicate the current location. In this case, the trigger from outside refers to reception of phone/mail from a specified party or reception of a mail including specified information (specified character strings).

When the base station side or the cellular phone side can acquire more precise location information by GPS system, an absolute location such as latitude and longitude may be used in place of the location information of the base station. The judgment reference in change to the emergency mode can be changed from the cell unit to an absolute range (longitude and latitude/city, town and village).

To avoid malfunction, when movement to an unknown cell is previously found, the notification function for a deviation from the activity range can be released or it can be displayed in the alert mode. The cellular phone is described above as the target of the present invention, but the present invention can be also applied to PHS. When using PHS, the handled range (the size of a cell) of the base station thereof is typically smaller than that of the cellular phone. Notification of deviation from a smaller activity range and more precise location information can be notified.

An embodiment of a mobile communication system of the present invention will be described. FIG. 5 is a diagram showing the configuration of the mobile communication system of this embodiment. In the mobile communication system of this embodiment, when the activity range of a cellular phone/cellular phone user is deviated, the system side automatically notifies deviation from the activity range to a registered contact. In FIG. 5, a base station mainly has a radio part 110, a memory part 111, a CPU part 112 and a phone exchange part 113.

The memory part 111 is provided with an identification number storage part for registering an identification number (or a phone number) of a cellular phone notifying deviation from the activity range as described later. As shown in FIG. 2, the base station is arranged for each cell. The cellular phone has a radio part 114, a memory part 115, a CPU part 116, and an input part (operational part) 117.

The specific operation of this embodiment will be described with reference to the flowchart shown in FIG. 6. The operation for operating the cellular phone to be set to the memory mode and registering the location information of the normal activity range into the identification information storage part of the base station is described. The memory mode or the later-described notification mode, as the operation mode, is set using the setting function that the cellular phone has. For example, the case of a normal activity range in which the cellular phone user moves from home to a visiting place, as shown in FIG. 4 will be described.

In FIG. 6, the cellular phone user staying at home turns on the cellular phone, and then, operates it by the operational part 107 to be set to the memory mode. At this time, the base station of cell A in which the cellular phone is located currently identifies the identification information of the cellular phone (S201). Then, the CPU part 112 in the base station determines whether the identification information is not registered into the identification information storage part (S202). In this case, since the memory mode has just started, the identification information is not registered.

When the identification information is not registered, the timer, not shown, in the base station is activated to start measuring the stay time of the current cell A (S203). A determination is made if the operation mode of the cellular phone is the memory mode (S204). Since it is set to the memory mode at this time, the routine is advanced to S205. In S205, the measured value of the timer is monitored to register the identification information from the cellular phone into the identification information storage part when the stay time of the current cell A is beyond the set time (S206). The process is then terminated.

When a handover occurs in S207 before the measured value of the timer reaches the set time in S205, the process is terminated without registering the identification information from the cellular phone. When the stay time in the cell is shorter than the set time, the identification information from the cellular phone is not registered so as not to identify it as the normal activity range, as described above. In this case, the identification information from the cellular

phone is registered into the identification information storage part of the base station A.

When the cellular phone user leaves home to move to the nearest station, the base station of cell D including the nearest station identifies the identification information from the cellular phone (S201). Then, the CPU part 112 in the base station judges whether the identification information from the cellular phone is not registered into the identification information storage part (S202). In this case, the base station D judges that the identification information from the cellular phone is not registered, activating the timer to start measuring the stay time of the current cell D (S203).

Whether the operation mode is the memory mode or not is judged (S204). In this case, since it is the memory mode, the routine is advanced to S205. When the measured value of the timer is beyond the set time, the identification information from the cellular phone is registered into the identification information storage part of the base station D (S206). In this case, the stay time in the cell D is beyond the set time and the identification information from the cellular phone is registered into the identification information storage part of the base station D.

The cellular phone user gets on a train at the nearest station of the cell D and passes cells E and F to go to the station of cell G to get off the train. In this case, each time the base stations of the cells E, F and G identify the identification information from the cellular phone, the process of S201 to S207 of FIG. 6 is performed. The stay time of the cells E and F is only a time during

which the train passes. The identification information from the cellular phone is registered into the base stations of the cells E and F and the identification information is also registered into the base station of the cell G including a station to get off the train.

When arriving at the nearest station, the cellular phone user goes to cell H including a visiting place. When the base station of the cell H identifies the identification information from the cellular phone, the process of FIG. 6 is executed. In this case, the stay time in the cell H is longer than the set time and the identification information from the cellular phone is registered into the base station in the cell H. In the memory mode, the identification information from the cellular phone is sequentially registered as the normal activity range of the cellular phone user into the identification information storage part of the base station. The identification information of the cellular phone is registered into the identification information storage part of the base stations of the cells A, D, E, F, G and H.

The operation of the notification mode will be described. In this case, the cellular phone user switches the operation mode from the memory mode to the notification mode. The notification mode is set using a function that the cellular phone has, as described above. In the notification mode, when the cellular phone user is in the normal activity range, that is, in the activity cells (the cells A, D, E, F, G and H) into which the identification information is registered and the routine is advanced to S202 after the process of S201 of FIG. 6, the

identification information from the cellular phone is judged to be registered. The routine is thus terminated.

When the activity range of the cellular phone user is deviated from the registered cell, e.g., when he/she leaves home to go to the cell B in the opposite direction without going to the cell D including the nearest station, or when he/she leaves the cell H including a visiting place to go to the cell I in the opposite direction without going to the cell G including the nearest station, the identification information is judged to be unregistered in S202 after the process of S201. The routine is thus advanced to S203. The timer is activated to start measuring the stay time of the current cell (for example, the cell B).

Whether the operation mode is the memory mode or not is judged in S204. At this time, the operation mode set to the notification mode is changed to the alert mode (S208). When it is changed to the alert mode, the measured value of the timer is monitored (S209). When the measured value of the timer is beyond the set time, it is moved to the emergency mode.

In the emergency mode, the base station inquires the center exchange, not shown, to acquire the contact (phone number or mail address) of the cellular phone registered into the contact storage part, not shown, of the exchange, and then, automatically notifies to the contact, by means of voice or mail, a message notifying deviation from the normal activity range and the location information of the current base station (S210). The exchange side registers a contact for each cellular phone. The base station which registers the

identification information of the cellular phone for the first time acquires the contact from the cellular phone to transmit it to the exchange for registration.

When a handover occurs in S211 before the measured value of the timer reaches the set time in S209, the process is terminated without change to the emergency mode. Depending on an electric wave state, particularly, in the case of stay in the corner of the cell, a handover may occur. Therefore, deviation from the activity range is not notified to avoid error notification.

In this embodiment, when the base station side identifies the identification information from the unregistered cellular phone, deviation from the activity range is notified automatically. The person who receives the notification can find that the cellular phone user is located in a cell different from the normal life space and can check whether he/she is safe or not by a return mail or phone. The location information from the base station in the current cell is notified at the same time. It is possible to acquire the approximate location information on where the cellular phone user is located currently.

This embodiment automatically notifies that the cellular phone and cellular phone user are located in a cell different from the normal one. When an emergency state such as loss/stealing or kidnapping/missing is caused, a quick response can be made. The cellular phone of this embodiment is put in a bag or a car so that a quick response can be made when they are stolen.

In FIG. 6, in the case of stay in the unregistered cell beyond the set time, deviation from the activity range is transmitted automatically. The present invention is not limited to this. There is calculated a time interval to identify the

identification information between the base stations or a moving speed of the cellular phone based on the size of the cell or the identification information obtained from the cellular phone. Then, when the time interval is shorter than the set value and the moving speed exceeds the set value in S209, stay in the unregistered cell beyond the set time will not perform automatic transmission.

When moving at high speed by taxi or train, the cell may be the unregistered cell in the memory mode. In the case of stay in the unregistered cell beyond the set time, automatic transmission may not be performed. When there is no possibility of movement at high speed in the manner of a child walking to school, movement at high speed is abnormal. Whether the time interval is below the set value or not, or whether the moving speed is above the set value or not is judged in S209. When the time interval is below the set value or the moving speed is above the set value, automatic transmission is desirable.

In the case of stay in the unregistered cell beyond the set time, the base station actively performs automatic transmission. It is also possible to passively transmit the current location information to the set destination from the base station by a trigger from outside. This can indicate the current location of the cellular phone. The trigger from outside refers to reception of phone/mail from a specified party or reception of a mail including specified information (specified character strings).

To avoid malfunction, when movement to an unknown cell is previously found, the notification function for deviation from the activity range can be released or it can be displayed in the alert mode. The cellular phone is

described above as the target of the present invention, but the present invention can be also applied to PHS. When using PHS, the handled range (the size of a cell) of the base station thereof is typically smaller than that of the cellular phone. Notification of deviation from a smaller activity range and more precise location information can be notified.

Obviously, numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

The text of the abstract filed herewith is repeated here as part of the specification.

When an operational mode of a mobile terminal is set to a memory mode, the location information of an area of a base station as a contacted party is registered. When the operational mode is changed to a notification mode, a determination is made as to whether the base station as a contacted party is a base station in an unregistered area which is not registered into a storage means. Then, when the contacted party is the base station in the unregistered area, any deviation from an activity range is sent to a registered contact. This can automatically transmit any deviation from the normal activity range.

CLAIMS:

1. A mobile communication device, comprising:  
registering means for registering a permitted geographical area for the device; and,  
judging means for judging whether said mobile communication device is in said registered area;  
the device being configured to transmit a message reporting its departure from said permitted geographical area when it is judged that said mobile communication device is not in said permitted geographical area.
  
2. A mobile communication device, comprising:  
registering means for registering area information about a base station;  
storing means for storing information about an apparatus to be notified;  
judging means for judging whether said mobile communication device is in a registered area in said registered means; and,  
notifying means for notifying said apparatus about a deviation from said registered area when it is judged that said mobile communication device is not in said registered area.
  
3. The mobile communication device as claimed in claim 2, wherein said notifying means simultaneously sends current location information of said mobile communication device to said apparatus.

4. The mobile communication device as claimed in claim 3, further comprising a counting means for counting time when said mobile communication device stays in an unregistered area.

5. The mobile communication device as claimed in claim 4, wherein said notifying means notifies said apparatus about a deviation from said registered area when said time reaches a predetermined time.

6. The mobile communication device as claimed in claim 5, wherein said registering means registers area information about a new area if said area information is not registered into said registering means when said time reaches the predetermined time.

7. The mobile communication device as claimed in claim 6, further comprising a sending means for sending back said current location information upon inquiry from a specified party.

8. The mobile communication device as claimed in claim 7, wherein said mobile communication device is a portable telephone.

9. The mobile communication device as claimed in claim 3, further comprising a counting means for counting time when said mobile communication device cannot make contact with a base station.

10. The mobile communication device as claimed in claim 9, wherein said notifying means notifies said apparatus about a deviation from said registered area when said time reaches a predetermined time.

11. The mobile communication device as claimed in claim 3, further comprising a calculating means for calculating a time interval during which a handover occurs between base stations.

12. The mobile communication device as claimed in claim 2, further comprising a calculating means for calculating a moving speed based on the size of the area and the location information from the base station.

13. The mobile communication device as claimed in claim 11 or 12, wherein said notifying means notifies said apparatus about a deviation from said registered area when said time is over a predetermined time.

14. The mobile communication device as claimed in claim 13, wherein said notifying means does not notify said apparatus about a deviation from said registered area when said time is below a predetermined time.

15. A base station, comprising:  
registering means for registering a permitted geographical area for a mobile communication device; and,  
judging means for judging whether said mobile communication device is

in said permitted geographical area;

the base station being configured to transmit a message reporting a departure of the mobile communication device from said permitted geographical area when it is judged that said mobile communication device is not in said permitted geographical area.

16. A base station, comprising:

registering means for registering identification information of a mobile communication device;

storing means for storing information about an apparatus to be notified;

judging means for judging whether said identification information of said mobile communication device is registered into said registering means; and,

notifying means for notifying said apparatus about a deviation from an activity range when said identification information of said mobile communication device is not registered into said registering means.

17. The base station as claimed in claim 16, wherein said notifying means simultaneously sends current location information of said mobile communication device to said apparatus.

18. The base station as claimed in claim 17, further comprising a counting means for counting time while said mobile communication device stays in an area covered by said base station when said identification information of said mobile communication device is not registered into said registering means.

19. The base station as claimed in claim 18, wherein said notifying means notifies said apparatus about a deviation from said activity range when said time reaches a predetermined time.

20. The base station as claimed in claim 19, wherein said registering means registers said identification information of said mobile communication device if said identification information is not registered into said registering means when said time reaches a predetermined time.

21. The base station as claimed in claim 20, further comprising sending means for sending said current location information of said mobile communication device upon inquiry from a specified party.

22. The base station as claimed in claim 21, wherein said mobile communication device is a portable telephone.

23. A method for notifying deviation of a mobile communication device from a predetermined area, comprising the steps of:

registering information regarding a permitted geographical area;

judging whether the mobile communication device is in said permitted geographical area; and,

notifying departure from said permitted geographical area when it is judged that said mobile communication device is not in said permitted geographical area.

24. A method for notifying deviation of a mobile communication device from a predetermined area, comprising the steps of:

registering area information about said predetermined area, including base station information;

storing information about an apparatus to be notified;

judging whether the mobile communication device is in said predetermined area; and,

notifying deviation from said predetermined area to said apparatus when it is judged that said mobile communication device is not in said predetermined area.

25. The method for notifying deviation from a predetermined area as claimed in claim 24, further comprising notifying current location information of said mobile communication device to said apparatus.

26. The method for notifying deviation from a predetermined area as claimed in claim 25, further comprising:

counting time while said mobile communication device stays in a predetermined area; and,

notifying said apparatus about a deviation from said predetermined area when said time reaches a predetermined time.

27. The method for notifying deviation from a predetermined area as claimed in claim 26, further comprising;

judging whether area information of a base station that said mobile communication terminal contacts has already been registered; and,

registering area information about a new area when said time reaches a predetermined time, if said area information is not already registered.

28. The method for notifying deviation from a predetermined area as claimed in claim 27, further comprising:

sending back said current location information upon inquiry from a specified party.

29. The method for notifying deviation from a predetermined area as claimed in claim 27, wherein said mobile communication device is a portable telephone.

30. A mobile communication device substantially as herein described with reference to and as shown in the accompanying drawings.

31. A base station substantially as herein described with reference to and as shown in the accompanying drawings.

32. A method for notifying departure of a mobile communication device from a predetermined area, the method being substantially as herein described with reference to the accompanying drawings.



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Application No:	GB 0227791.1	Examiner:	Riz Mohammad
Claims searched:	1 to 15 and 23 to 32	Date of search:	20 May 2003

### Patents Act 1977 : Search Report under Section 17

#### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1, 2, 15, 23, 24 at least	JP2000069537 A	[GOTO]; Abstract.
X	1, 2, 15, 23, 24 at least	JP11098573 A	[SHIMIZU]; Abstract.
X	1, 2, 15, 23, 24 at least	JP7038959 A	[SHINOHARA]; Abstract.
X	1, 2, 15, 23, 24 at least	US5839063 A	[LEE]; Entire document.
X	3 at least	EP0897119 A	[BRITT & ETCHELLS]; Entire document.
X	12 at least	WO9641488 A	[COOPERMANN]; Entire document, claim 16 in particular.
A	1, 2, 15, 23, 24 at least	JP2002099971 A	[HAZUI & MAEDA]; Abstract.

#### Categories:

<input checked="" type="checkbox"/> Document indicating lack of novelty or inventive step	<input type="checkbox"/> Document indicating technological background and/or state of the art.
<input checked="" type="checkbox"/> Document indicating lack of inventive step if combined with one or more other documents of same category.	<input type="checkbox"/> Document published on or after the declared priority date but before the filing date of this invention.
<input checked="" type="checkbox"/> Member of the same patent family	<input type="checkbox"/> Patent document published on or after, but with priority date earlier than, the filing date of this application.

#### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>6</sup>:

H4L

Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:

H04Q

The following online and other databases have been used in the preparation of this search report :

Online: ECLA, WPI, PAJ.